Attorney's Docket No.: 19078-003US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Fukunishi et al.
Serial No. : 10/565,836
Filed : January 25, 2006
Title : FABRIC AND PRODUCTION PROCESS THEREOF

Art Unit : 3765
Examiner : Muromoto, R.

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. § 1.132

I, the undersigned, declare that:

1. My name is Yoshihiro Matsui, and I reside in Kyoto, Japan.

2. I am a joint inventor in the above-identified patent application ("The Patent Application").

3. In 1994, I graduated from the Kyoto Institute of Technology graduate school of science and technology.

4. I have worked at Toyobo Co., Ltd., the assignee of The Patent Application, for thirteen years in the textile field.

5. At my direction, Japan Spinners Inspecting Foundation performed testing on four polyester samples of fabric. The testing was completed on September 25, 2007 in Osaka, Japan. The samples were tested for weight per square-meter (g/m^2), tear strength in the warp cut direction and the weft cut direction (N), air permeability ($cm^3/cm^2 \cdot s$) and yarn linear density (denier) in warp cut direction and the weft cut direction.

6. A copy of the original Test Certificate in Japanese is attached as Exhibit 1 to this Declaration. A translation of the original Test Certificate in English is attached as Exhibit 2 to this Declaration.

7. According to the Test Certificate, the testing was performed in accordance with Japanese Industrial Standards JIS L 1096. A copy of the applicable standards in English is attached as Exhibit 3 to this Declaration. Testing relating to the tear strength was done according to the pendulum method.

8. The first sample, Sample 1, is a nominally 20 denier (warp) by 30 denier (weft) fabric.

9. The second sample, Sample 2, is a nominally 30 denier (warp) by 30 denier (weft) fabric.

10. The third sample, Sample 3, is a nominally 40 denier (warp) by 40 denier (weft) fabric.

11. The fourth sample, Sample 4, is a nominally 50 denier (warp) by 50 denier (weft) fabric.

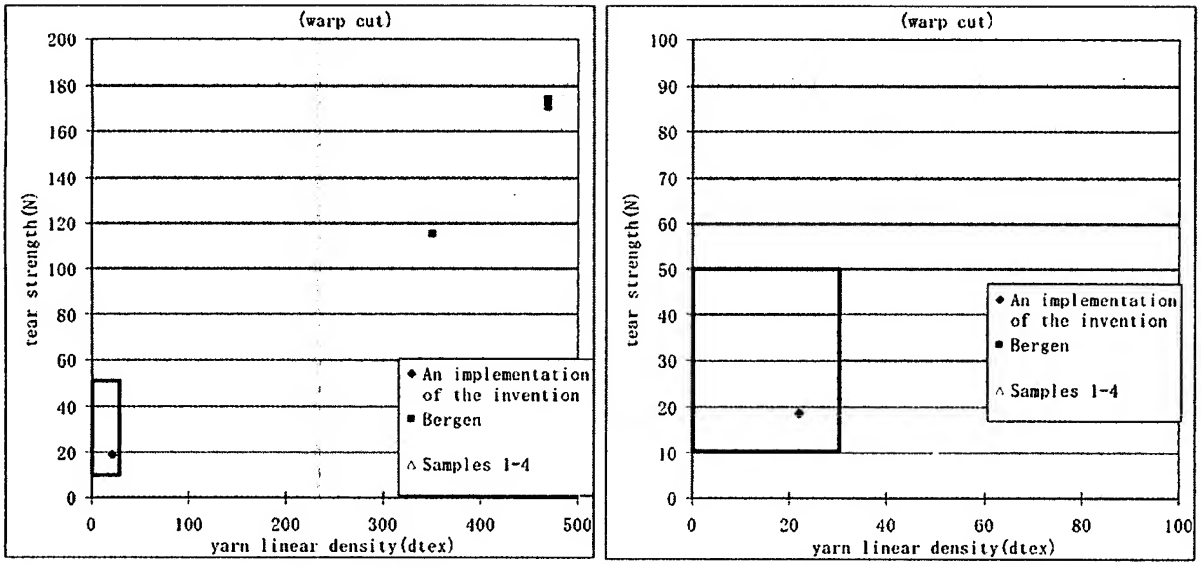
12. The results of Japan Spinners Inspecting Foundation's testing of Samples 1-4 are set forth in Exhibits 1 and 2, and are reproduced here for convenience:

		Unit	Sample 1	Sample 2	Sample 3	Sample 4
Weight Per Square-Meter		g/m^2	41.0	55.0	61.0	79.0
Tear Strength	Warp	N	4.4	7.8	9.9	12.6
	Weft	N	4.6	4.4	9.5	10.9
Air-permeability		$cm^3/cm^2 \cdot s$	1.0	0.2	0.7	0.8
Yarn Linear Density	Warp	Denier	23.4	34.8	45.0	61.2
	Weft	Denier	34.2	36.0	48.6	63.0

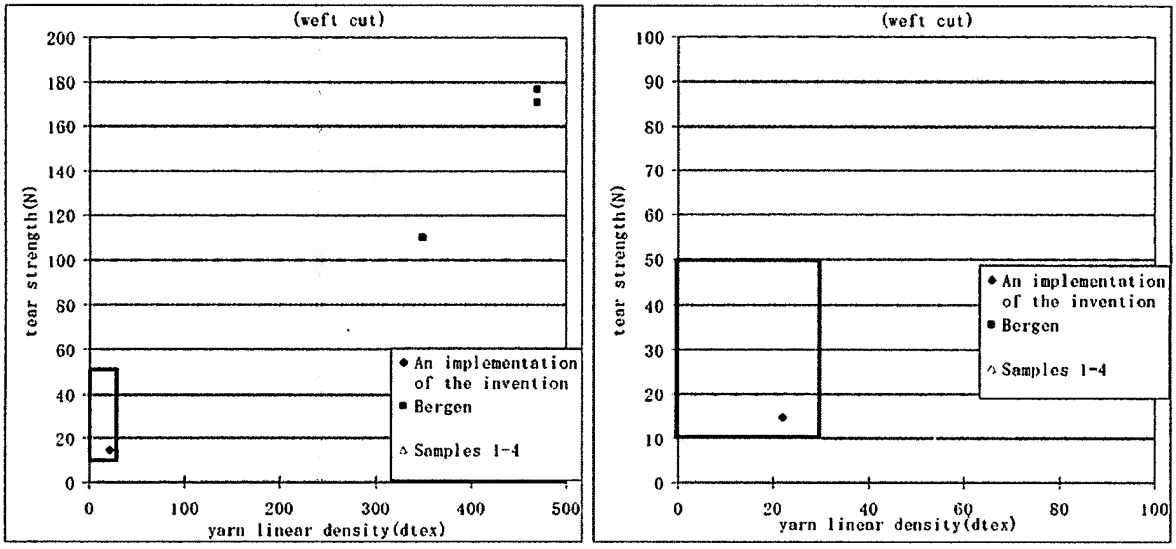
13. The following table compares the test results of Paragraph 12 with examples disclosed in The Patent Application and U.S. Patent No. 5,693,392 (Bergen et al.). Japan Spinners Inspecting Foundation performed its yarn linear density testing in the units of deniers. I have converted the yarn linear density test results into dtex using the commonly accepted conversion factor of 1 dtex = 0.9 denier.

Fabric		Yarn Linear Density (Denier)	Yarn Linear Density (dtex)	Tear Strength, Warp Direction (N)	Tear Strength, Weft Direction (N)	Average Tear Strength (N)	Weight Per Square-Meter
Example 1 of The Patent Application			22	18.6	14.7	16.65	35.8
Bergen et al. Example 1			350	115	110	112.5	215
Bergen et al. Example 2			470	174	177	175.5	245
Bergen et al. Example 3			470	171	171	171	245
Sample 1	Warp	23.4	26.0	4.4			
	Weft	34.2	38.0		4.6		
	Average	28.8	32.0			4.5	41
Sample 2	Warp	34.8	38.7	7.8			
	Weft	36	40.0		4.4		
	Average	35.4	39.3			6.1	55
Sample 3	Warp	45	50.0	9.9			
	Weft	48.6	54.0		9.5		
	Average	46.8	52.0			9.7	61
Sample 4	Warp	61.2	68.0	12.6			
	Weft	63.0	70.0		10.9		
	Average	62.1	69.0			11.75	79

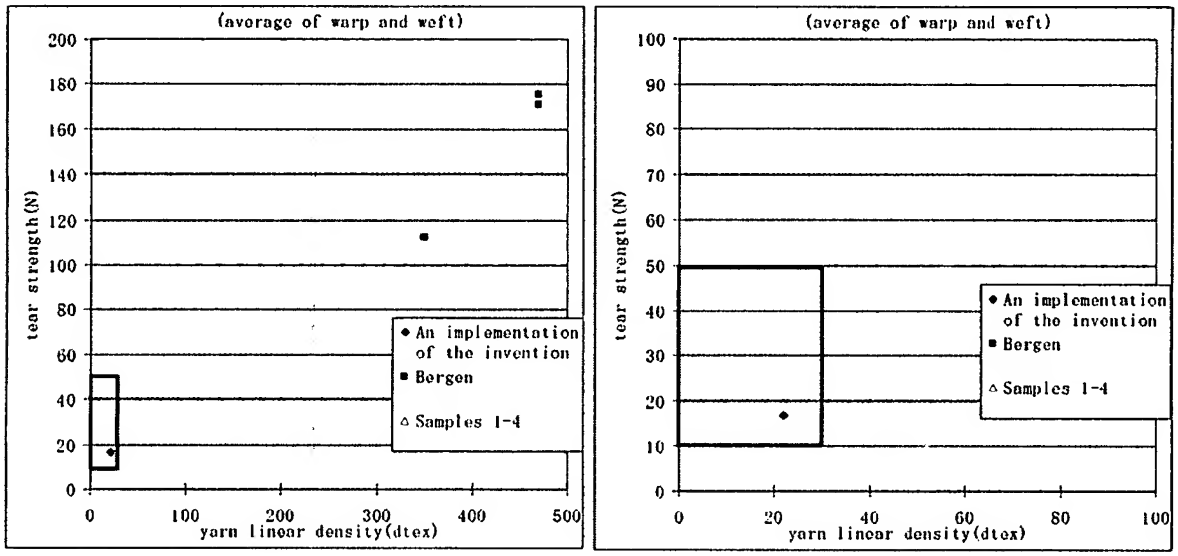
14. Based on the data presented in Paragraph 13, I prepared the following graphs which illustrate the relationship between yarn linear density and tear strength in the warp cut direction of each fabric. The graph on the right side of the page has enlarged x- and y-axes relative to the graph on the left side. In each graph, the red frame represents the numerical characteristics of the claim language "the tear strength in the warp cut direction . . . according to the pendulum method [is] . . . from 10 to 50 N" and "the yarn linear density is 30 dtex or less" in amended claim 1.



15. Based on the data presented in Paragraph 13, I prepared the following graphs which illustrate the relationship between yarn linear density and tear strength in the weft cut direction of each fabric. The graph on the right side of the page has enlarged x- and y-axes relative to the graph on the left side. In each graph, the red frame represents the numerical characteristics of the claim language "the tear strength in the . . . weft cut direction according to the pendulum method [is] . . . from 10 to 50 N" and "the yarn linear density is 30 dtex or less" in amended claim 1.



16. Based on the data presented in Paragraph 13, I prepared the following graphs which illustrate the relationship between yarn linear density and the average tear strength in the warp cut and the weft cut direction of each fabric. The graph on the right side of the page has enlarged x- and y-axes relative to the graph on the left side. In each graph, the red frame represents the numerical characteristics of the claim language "the tear strength in the warp cut direction and that in the weft cut direction according to the pendulum method are each from 10 to 50 N" and "the yarn linear density is 30 dtex or less" in amended claim 1.



17. I declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true.

Further declarant saith not.

Respectfully submitted,

Date: Oct. 17, 2007 Yoshihiro Matsui

EXHIBIT 1

試 験 証 明 書

207

2007年 9月25日

東洋紡績(株) 殿

試験番号０２２６０４－１
(完)

ご提出の試料に対する試験結果は下記の通りです。

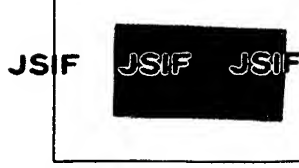
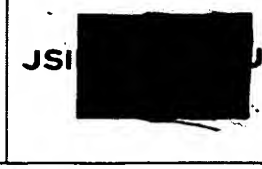
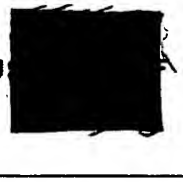
No.	品番・品名及び色柄番
1	織物生地 20de×30de
2	織物生地 30de×30de
3	織物生地 40de×40de
4	織物生地 50de×50de

財団法人 日本繊維検査協会
近畿繊維試験所
大阪市中央区上町１丁目１番１５号
TEL 大阪(06) 6762-5887(代表)
FAX 大阪(06) 6762-8588

試験項目	試験方法及び条件
1.単位面積当りの質量	JIS-L-1096 見掛け重さ 標準状態
2.引裂強さ	JIS-L-1096 ﾍﾟﾝｼﾞｭﾗﾑ法
3.通気性	JIS-L-1096 A法
4.織度	JIS-L-1096 見掛け たてよこ

試 験 結 果

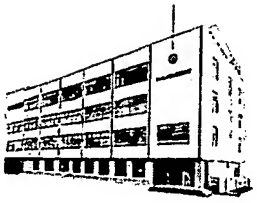
項目	区分	1.	2.	3.	4.	注
1.単位当り質量	(g/㎡)	41.0	55.0	61.0	79.0	
2.引裂強さ	たて(N)	4.4	7.8	9.9	12.6	
	よこ(N)	4.6	4.4	9.5	10.9	
3.通気性(A法)	cm³/cm²·s	1.0	0.2	0.7	0.8	
4.織度(見掛け)	たて (D)	23.4	34.8	45.0	61.2	
	よこ (D)	34.2	36.0	48.6	63.0	

1	2	3	4
			

本試験結果はご提出の試料に対するものであって、荷口を代表するものではありません。

EXHIBIT 2

TELEPHONE : OSAKA06 (6762) 5887
FAX. : OSAKA06 (6762) 8588



JAPAN SPINNERS INSPECTING FOUNDATION

ORIGINAL

18-15, 1-CHOME, UE-MACHI CHUO,
OSAKA, 540-0005 JAPAN

TEST CERTIFICATE

Test No. JSIF 022604
DATE : Sep. 25, 2007

Applicant : TOYOBO CO., LTD.

Sample : 4 samples of woven fabric
① 20de×30de
② 30de×30de
③ 40de×40de
④ 50de×50de

Test Item and Result :

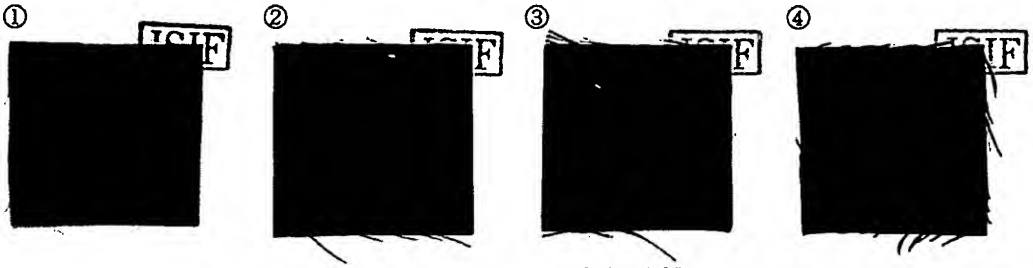
		①	②	③	④
1. Weight (g/m²)		41.0	55.0	61.0	79.0
2. Tearing Strength (N)	Warp	4.4	7.8	9.9	12.6
	Filling	4.6	4.4	9.5	10.9
3. Air Permeability (cm³/cm²·s)		1.0	0.2	0.7	0.8
4. Fineness (D)	Warp	23.4	34.8	45.0	61.2
	Filling	34.2	36.0	48.6	63.0

Test Method :

1. Weight : JIS L 1096 Apparent Standard condition
2. Tearing Strength : JIS L 1096 Pendulum method
3. Air Permeability : JIS L 1096 A method
4. Fineness : JIS L 1096 Apparent

Presented samples

① ② ③ ④



JAPAN SPINNERS INSPECTING FOUNDATION

Supervised by M. Kawata

Notice ——The report applies only to sample tested and not to the lot.

EXHIBIT 3

UDC 677.064:677.01

JIS

JAPANESE INDUSTRIAL STANDARD

Testing Methods for Woven Fabrics

JIS L 1096–1990

Translated and Published

by

Japanese Standards Association

Printed in Japan

46 S

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

Contents

UDC 677.064:677.01

JAPANESE INDUSTRIAL STANDARD

J I S

Testing Methods for Woven Fabrics

L 1096-1990

1. Scope

This Japanese Industrial Standard specifies the testing methods for the evaluation of general characteristics of woven fabric foundation cloth (1).

Note (1) Test methods for hosiery fabrics, carpets and rugs, urethane clothing, flocked clothing, and bonded clothing for garment shall be as specified in the appropriate Standards.

Remark: The units and numerical values given in { } in this Standard are based on the traditional units and are currently the criteria in force.

2. Definition

The definitions of the terms used in this Standard shall be as follows:

(1) standard condition of test room or apparatus The condition of the test room or the test apparatus within the tolerance range of 20 ± 2°C and 65 ± 2 % with respect to temperature and humidity as specified in JIS Z 8703.

(2) standard condition of sample The state of a sample having reached moisture equilibrium after left in the test room under the standard condition.

(3) moisture equilibrium The state of a sample having reached a constant mass or a constant length after left in the test room under the standard condition subsequent to preliminary drying making moisture regain lower than official regain (temperature 40 ± 5°C).

Remark: Fabrics 0 % in official regain may dispense with preheating.

(4) absolute dry condition of sample The state of a sample having attained a constant mass after kept in a drier kept at a temperature of 105 ± 2°C.

Remark: For fabrics 0 % in official regain, its standard condition shall be regarded as the absolute dry condition.

(5) absolute dry mass The mass of a sample attained when it has been kept under the absolute dry condition.

(6) Constant mass When the mass of a sample is measured at an interval of 1 h or longer in a moisture equilibrium and at an interval of 15 min or longer in an absolute dry mass state, the state in which the difference between the two mass values successively weighed comes to within 0.1 % of the latter mass value.

Applicable Standards, Corresponding International Standards and Reference Standards: See pages 79 to 83.

(7) constant legnth When the length between gauge marks of the sample (200 mm) is measured at an interval of 1 h or longer, the state in which the difference between the two length values successively measured comes to within 0.5 % of the latter length.

(8) official regain Official value of regain, which is the percentage of the difference between the mass of a textile material measured at an arbitrary temperature and its absolute dry mass relative to the absolute dry mass.

(9) corrected mass A mass obtained by adding a mass equivalent to official regain to an absolute dry mass.

(10) yarn number count and fineness A unit expressing thread thickness. The yarn number counts and finenesses used in this Standard shall be as follows:

(a) cotton yarn number A yarn number count which expresses a thread length per 453.59 g in corrected mass by the number of hanks (one hank is 768.1 m).

(b) metric count A yarn number count which expresses a thread length per 1 g in corrected mass by the number of meters.

(c) flax yarn number A yarn number count which expresses a thread length per 453.59 g in corrected mass by the number of leas (one lea is 274.32 m).

(d) jute yarn number A yarn number count which expresses a thread corrected mass per 29.029 km in length by the number of kilograms.

(e) denier (D) A thread corrected mass per 9 km in length expressed by the number of grams.

(f) Tex (tex) A thread corrected mass per 1 km in length expressed by the number of grams.

(11) initial testing force A load applied in the first stage to an extent that it will not elongate the test piece but will eliminate unnatural wrinkles.

3. Sampling and Preparation of Specimen

A sample shall be large enough to take a specimen therefrom. The specimen shall, as a rule, be taken from a part 100 cm or over apart from the end of fabrics, and from a part 10 cm or over apart from each selvage, if any, to be kept under the standard condition. However, when this provision is not applicable, the specimen shall be taken from a part representive of the fabrics to be kept under the standard condition.

Further, when the sample is a product, the specimen shall be taken at random to be rendered into the standard condition.

Furthermore, to a test not affected by temperature and humidity, this provision does not apply.

4. Test Conditions

4.1 Testing Site A test site shall be a test room kept under the standard conditions. If a test room cannot keep the standard condition, the place as close to the standard condition as possible shall be selected and, in this case, the temperature and humidity at the time of the test shall be noted in the report. However, the test which temperature and humidity do not affect shall be exempted from the application of the above rule.

4.2 Absolute Dry Mass In order to obtain an absolute dry mass, it is permitted to use an infrared drier, pressure reducing drier, etc. in place of a hot air drier. In this case, the drier used shall be noted in the test report.

For a fabric composed of fiber to be influenced by temperature, a temperature below 105°C shall be used, and the temperature used shall be noted in the test report.

4.3 Official Regain The official regain of a fabric made of a kind of fiber shall be as given in Table 1. The official regain of a fabric of fiber mixture shall be calculated from the formulas below by the use of official regain of Table 1 given for each individual fiber composing the fabric.

(1) When obtaining from mixture ratio based on absolute dry mass,

$$R=\frac{AR_1+BR_2+\cdots\cdots+NR_n}{100}$$

where, R : calculated official regain (%) of fabric of fiber mixture

$A, B, \cdots, N$: mixture ratio (%) based on absolute dry mass of each individual fiber

$R_1, R_2, \cdots, R_n$: official regain (%) of individual fiber.

(2) When obtaining from mixture ratio based on corrected mass,

$$R=\frac{\dfrac{aR_1}{1+\frac{R_1}{100}}+\dfrac{bR_2}{1+\frac{R_2}{100}}+\cdots+\dfrac{nR_n}{1+\frac{R_n}{100}}}{\dfrac{a}{1+\frac{R_1}{100}}+\dfrac{b}{1+\frac{R_2}{100}}+\cdots+\dfrac{n}{1+\frac{R_n}{100}}}$$

where, R : calculated official regain (%) of fabric of fiber mixture

$a, b, \cdots, n$: mixture ratio (%) based on corrected mass of individual fiber

$R_1, R_2, \cdots, R_n$: official regain (%) of each individual fiber.

Remark: Expansion of the formula given in (2) above will be the following:

$$\frac{100}{100+R}=\frac{a}{100+R_1}+\frac{b}{100+R_2}+\cdots+\frac{n}{100+R_n}$$

or

$$R=\left(\frac{1}{\frac{a}{100+R_1}+\frac{b}{100+R_2}+\cdots+\frac{n}{100+R_n}}-1\right)\times 100.$$

Table 1. Official Regain of Each Fiber

Nature of fiber	Official regain (%)	Nature of fiber	Official regain (%)
Cotton	8.5	Vinylon	5.0
Wool	15.0 ([2])	Vinylidene	0
Silk	12.0 ([3])	Polyvinylchloride	0
Flax and ramie	12.0	Polyester	0.4
Jute	13.75	Acryl and acryl type	2.0
Rayon	11.0	Polyethylne	0
Polynosic	11.0	Polypropyrene	0
Cupra	11.0	Polyurethane	1.0
Acetate	6.5	Polyclar	3.0
Triacetate	3.5	Benzoate	0.4
Promix	5.0	Glass fiber	0
Nylon	4.5	Aramid	7.0

Notes ([2]) This regain to be effected under the standard condition shall be used, unless otherwise specified.

([3]) This regain applies to the degummed silk.

4.4 Temperature and Humidity Humidity shall be obtained by using Meteorological Agency type or Assmann's type aspiration psychrometer specified in JIS Z 8806, and relative humidity shall be obtained from the humidity table based on Sprung's formula.

5. Test Items

The test items for this Standard shall be as enumerated below.

(1) Weave

(2) Width

(3) Length

(4) Mass per unit area

(5) Thickness

(6) Density

(7) Crimp percentage of yarn

(8) Structure of yarn used

(9) Moisture regain

(10) Apparent specific gravity and pore volume

(11) Bowing

(12) Tensile strength and elongation percentage

(13) Elongation elastic modulus

(14) Stretchability of stretch fabrics

(15) Tearing strength

(16) Bursting strength

(17) Abrasion resistance

(18) Compressibility and compression elastic modulus

(19) Stiffness

(20) Bending repulsion

(21) Slippage resistance

(22) Wrinkle recovery

(23) Wrinkles after laundering

(24) Pleat retention

(25) Drying property

(26) Water absorbing property

(27) Air permeability

(28) Warmth keeping property

(29) Light resistance

(30) Weather resistance

(31) Mothproofness

(32) Discoloration due to abrasion

(33) Size content

(34) Determination of resin and resin content

(35) Oily and fatty matter

(36) Solvent extract

(37) Scouring loss

(38) Degumming loss

(39) Free formaldehyde content

(40) pH value of extract liquid

(41) Barium activity count

(42) Permissible ironing temperature

(43) Glossiness

(44) Comparison of colors

(45) Forgins matter and nep

(46) Shrinkage percentage

(47) Shrinkage percentage by ironing

(48) Pilling

(49) Snag

(50) Pile retention

(51) Flammability

(52) Electrostatic propensity

(53) Water resistance

(54) Water vapor permeability

(55) Color fastness

(56) Migration of dyestuffs and finishing agents

(57) Dyestuff class

(58) Fluorescent brightening agents class

(59) Mixture ratio

Notes ([7]) The definite time herein stated means the duration of time which the fabric under the specified pressure requires to have a stabilized thickness. Ordinarily 10 min is preferable.

([8]) Pressure of 23.5 kPa {240 gf/cm^2} applies to ordinary fabrics, and pressure of 0.7 kPa {7 gf/cm^2} to raised or pile fabrics.

6.6 Density Place the sample prepared in accordance with 3. on a flat stand, remove unnatural wrinkles and tension, count the number of the warp and weft yarns at five different positions in an appropriate range ([9]) of the test specimen, and obtain each average value per unit length to one place of decimal.

Further, sample, as required, a specimen of an appropriate size normally to the warp and weft yarn directions from the sample prepared in accordance with 3., unravel the warp yarns and weft yarns out of the specimen, count the number of yarns in each of them, and obtain the density per unit length.

Note ([9]) The appropriate range is defined as 5 cm, 3 cm, 2.54 cm, etc.

Remark: For wool fabrics, the following procedure shall be the standard practice. Take four test specimens, each measuring 2.5 cm × 2.5 cm, at right angles separately to the warp and weft directions, unravel the warp yarns and weft yarns out of the specimens, count the number of warp and weft yarns in each specimen, and express as a rule, the density of warp and of weft per 10 cm by the total number of warps and wefts contained in the four specimens.

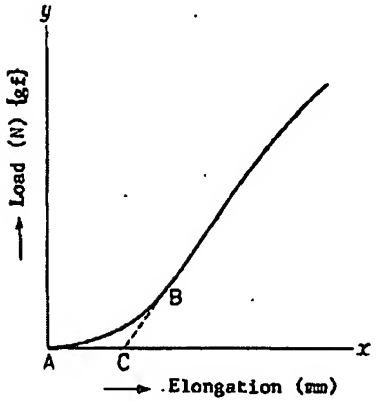
6.7 Crimp Percentage of Yarn

6.7.1 Method A Take two strip-shaped specimens approximately 35 cm in length, each in the warp and weft directions, from two places of the sample having been prepared in accordance with 3., mark at two positions 250 mm apart, and unravel five yarns each from the specimens with care not to untwist the yarns nor to stretch them. On a single yarn tension tester with autographic recorder, set the clamping distance at 250 mm, and make up the initial load - elongation curve as shown in Fig. 1. Draw a tangent touching the curve at the curved point B, obtain the point C of the tangential line intersecting the abscissa x, and calculate the crimp shrinkage from the formula below. Express the crimp shrinkage to one place of decimlas as average of 10 measurements each made for warp and weft yarns.

$$\text{Crimp percentage } (\%) = \frac{AC}{250} \times 100$$

where AC: crimp length (mm).

Fig. 1. Load-elongation Curve



6.7.2 Method B Mark the sample having been prepared in accordance with 3. at three positions 200 mm apart, each in the warp and weft directions, unravel the warp and weft yarns existing within the ranges between the marks, measure the length (mm) of the yarns tautened straight under the initial load ([10]), and obtain the crimp percentage (%) from the formula below.

Measure each five warp and weft yarns at one position, and express the crimp percentage as average of three positions each for the warp and weft yarns to be calculated to one place of decimals.

$$\text{Crimp percentage } (\%) = \frac{L - 200}{200} \times 100$$

where L: length of yarn when tautened straight (mm).

Note ([10]) The "initial load" is a load under which the yarn is kept straight, but not elongated. As the initial load, a load corresponding to the yarn length of 250 m shall be used for spun yarn, and a load equal to $\frac{49}{50}$ mN per 0.11 tex {$\frac{1}{10}$ gf per 1 D} of indicated fineness shall be used for filament yarn. When these loads are not suitable, other loads actually used for the measurement shall be noted in the test report.

6.8 Structure of Yarn Used

6.8.1 Yarn Number Count, Fineness and Lubrication

(1) Apparent Yarn Count and Fineness Take three test specimens, each measuring 20 cm × 20 cm ([11]), from the sample having been prepared in accordance with 3., unravel 25 lines each of warp and weft yarns from each specimen, and weigh the mass (mg). Obtain the apparent yarn count or fineness ([12]) by the formula below and express the apparent yarn count or fineness to one place of decimals as average of three measurements each made for the warp and weft yarns.

$$\text{Cotton count} = \frac{2952.7}{W} \times \left(1 + \frac{P}{100}\right)$$

$$\text{Metric count} = \frac{5000}{W} \times \left(1 + \frac{P}{100}\right)$$

$$\text{Flax count} = \frac{8267.7}{W} \times \left(1 + \frac{P}{100}\right)$$

$$\text{Jute count} = 0.0058 \times W \times \left(1 + \frac{P}{100}\right)$$

$$D = \frac{1.8 \times W}{1 + \frac{P}{100}}$$

$$\text{tex} = \frac{0.2 \times W}{1 + \frac{P}{100}}$$

where, W : mass of 25 yarns tested (mm)

P : crimp shrinkage (%)

D : denier

tex : tex.

Notes ([11]) The specimens shall be prepared by inserting the sample between two metallic plates measuring 20 cm × 20 cm and then by cutting off the part protruding from the metallic plates.

([12]) The "apparent yarn count or fineness" herein stated means the yarn count or fineness of yarns unraveled from the specimen.

Remark: Desizing and the like should be performed if necessary. The desizing method shall be as specified in 6.33.

(2) Indication of Yarn Number Count, Fineness and Blending Ratio

(a) Indication of Yarn Number Count As specified in 3.1 of JIS L 1095.

(b) Indication of Fineness As specified in 3.1 of JIS L 1013.

(c) Indication of Blending Ratio As specified in 3.2 of L 1095.

6.8.2 Twist Number, Percentage of Twist Shrinkage and Indication of Twist

(1) Twist Number The twist number of yarns unraveled from the sample prepared in accordance with 3. shall be as specified in 7.15 of JIS L 1095.

(2) Percentage of Twist Shrinkage As specified in 7.16 of JIS L 1095.

(3) Indication of Twist As specified in 3.3 of JIS L 1095.

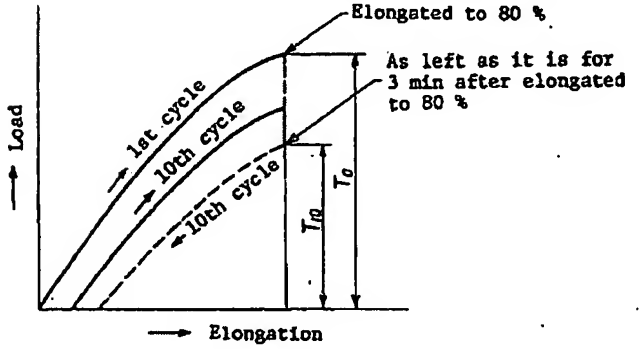
for 3 min after its elongation reaches 80 % ([23]) of that prescribed. Allow the tester to draw thereby the load-elongation curve as shown in Fig. 9, and obtain the percentage of stress relaxation (%) by the use of the formula below to one place of decimals as average of three measurements ([15]).

$$\text{Percentage of stress relaxation } (\%) = \frac{T_0 - T_{10}}{T_0} \times 100$$

where, T_0: load under which specimen is initially elongated to 80 % of that obtained by Method A of 6.14.1. (N{gf})

T_{10}: load under which specimen is left still for 3 min after the tenth elongation (N{gf}).

Fig. 9. Load-elongation Curve



6.15 Tearing Strength

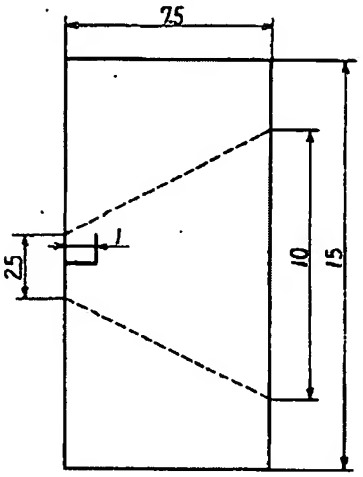
6.15.1 Method A-1 (Single-tongue Method) Take three test specimens, each measuring 5 cm × 25 cm, from the sample having been prepared in accordance with 3. each in the warp and weft directions, and give each a cut 10 cm in length at right angles to the short side in the middle of it. Using a tension tester having clamps 5 cm or more in width, hold each tongue-shaped specimen at right angles to the clamps with a clamping distance of 10 cm. Stretch the specimen at a tension speed of 15 cm or 20 cm per minute, and obtain the maximum load (N{kgf}) indicated when the specimen is torn. Express the average tearing strength of the weft yarns and the warp yarns each to one place of decimals. The test report shall include the test conditions.

Remark: The tearing strength of weft yarns means that indicated by the weft yarns when they are torn, and the tearing strength of warp yarns the strength indicated by the warp yarns when they are torn.

If tearing takes place abnormally, it shall be noted in the test report.

Fig. 11. Preparation of Test Specimen

Unit: cm



6.15.3 Method D (Pendulum Method) Take five test specimens measuring 6.3 cm × 10 cm, each in the warp and weft directions from the sample having been prepared in accordance with 3. Using an Elmendorf type tearing strength tester, give each specimen a cut 2 cm in length at right angles to the long side of the specimen in its middle point between both clamps, and measure the load (tearing strength) (N {kgf}) indicated when the remaining 4.3 cm length of the specimen is torn. Express the average tearing strength each of the weft yarns and warp yarns to a digit of integer.

Remark: The tearing strength of weft yarns means that indicated by the weft yarns when they are torn, and the tearing strength of warp yarns the strength indicated by the warp yarns when they are torn.

If tearing takes place abnormally, it shall be noted in the test report.

6.16 Bursting Strength

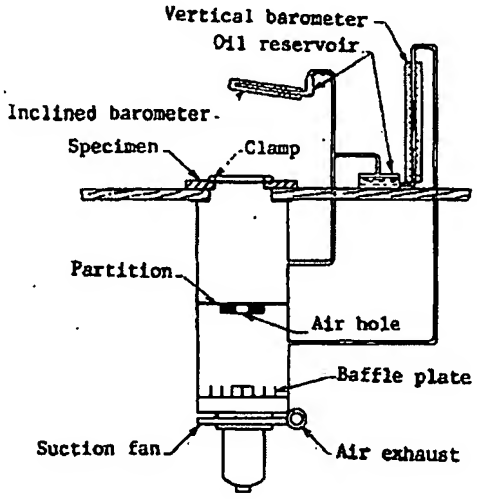
6.16.1 Method A (Müllen Type Method) Take five test specimens, each measuring approximately 15 cm × approximately 15 cm, from the sample having been prepared in accordance with 3. Using a Müllen type bursting strength tester, hold the specimen, with the surface of test specimen upward, in the clamp with a uniform tension just sufficient to eliminate wrinkles or slackening, and measure the strength (kPa {kgf/cm^2}) of the rubber diaphragm which bursts the specimen under the applied pressure and also the strength (kPa {kgf/cm^2}) of rubber diaphragm when the clamp is removed. Obtain the bursting strength (kPa {kgf/cm^2}) by the formula below, and express it to one place of decimals as average of five measurements.

The diameter of the clamp shall be 3.05 ± 0.03 cm, and generally the oil increasing rate for applying the pressure shall be 98 ± 4 ml/min.

6.27 Air Permeability

6.27.1 Method A Using a Frazir type tester shown in Fig. 51, attach the specimen to one end of the cylinder, and adjust the suction fan with the rheostat so that the inclined barometer shows a pressure of 1.27 cm on water column. Obtain the air volume ($cm^3/cm^2.s$) having passed through the specimen from the pressure indicated at the time by the vertical barometer and from the type of air hole used by the aid of the table attached to this tester. Measure the air volume, and express it to one place of decimals as average of five measurements.

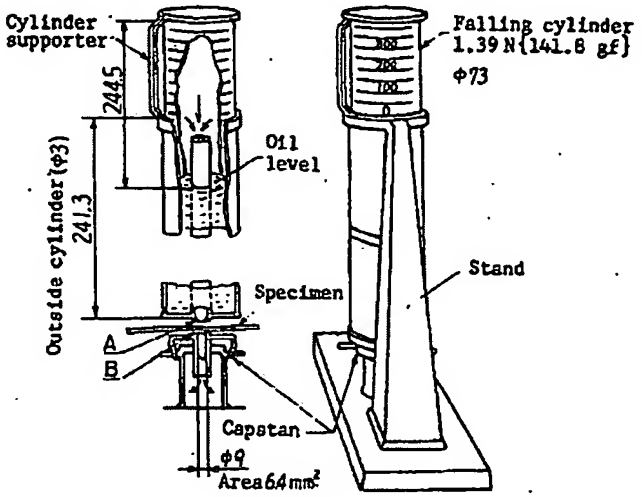
Fig. 51. Frazir Type Tester



6.27.2 Method B This method applies mainly to wool fabrics.

Take five test specimens, each measuring 5 cm × 5 cm, from five different places of a sample, insert a specimen in the air spouting orifice (9 mm in diameter) of an air permeability tester shown in Fig. 52, and fasten it. Measure the time required for 300 ml of air to spout through the specimen under the pressure of 1.39 N {141.8 gf}, and represent the air permeability by the use of the required time. Test three different places of each specimen, and express the required time to one place of decimals as average of the measurements made for five specimens.

Fig. 52 Unit: mm



Twist up the capstan to fasten the specimen with faces *A* and . Each caliber of *A* and *B* is 9 mm.

6.28 Warmth Keeping Property

6.28.1 Method A (Thermostatic Method) Using a warmth keeping tester, attach a sample to a thermostatic heat-generating element. Two hours after the calorific outflow toward the low temperature atmosphere stabilizes and the surface temperature of the heat-generating element shows a fixed value, obtain the heat loss dispersing through the specimen. Separately obtain the heat loss of the thermostatic heat-generating element with no specimen attached under the similar temperature difference and the same duration of time. Obtain the warmth keeping property (%) to one palce of decimals from the two heat losses mentioned above by the formula below. Note in the test report such testing conditions as the difference in temperature between the atmosphere and the surface of heat-generating element, and velocity and direction of airflow (to one place of decimals).

$$\text{Warmth keeping property } (\%) = \left(1 - \frac{b}{a}\right) \times 100$$

where, a: calorie radiated from bare heat-generating element [$J/cm^2 \cdot s$] {$cal/cm^2 \cdot s$ or W/cm^2}

b: calorie radiated from heat generating-element to which specimen is attached [$J/cm^2 \cdot s$ {$cal/cm^2 \cdot s$ or W/cm^2}.

6.28.2 Method B (Cooling Method) Cover the heat source element of a warmth keeping tester with a sample, and cool it down in airflow of low temperature. Measure the difference in temperature of the heat source element which is cooled in a fixed time or the difference in time required for the element to cool from a fixed temperature to the specified temperature.

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